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05/14/99

# NEW UTILITY PATENT APPLICATION TRANSMITTAL

(only for new nonprovisional applications under  
37 CFR 1.53(b))

Attorney Docket Number

3941

First Named Inventor

Taylor S. Gautier

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**APPLICATION ELEMENTS**

1. ☒ Fee Transmittal Form (in duplicate)  
☒ Check Enclosed
2. ☒ Specification  
(preferred arrangement set forth below)
  - Descriptive Title of the Invention
  - Cross Reference(s) to Related Case(s)
  - Statement Regarding Fed sponsored R & D
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawing(s)
  - Detailed Description
  - Claim or Claims
  - Abstract of the Disclosure
3. ☒ Drawing(s) (when necessary per 35 USC 113)
4. Oath or Declaration
  - a. ☒ New Declaration  
☒ Executed
  - b. ☐ Copy from a prior application (37 CFR 1.63(d))  
(for continuation/divisional with Box 17 completed)
    - i. ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting inventor(s)  
named in the prior application, see 37 CFR  
1.63(d)(2) and 1.33(b).
5. ☐ Incorporation by Reference (useable if Box 4b is checked). The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

**ACCOMPANYING APPLICATION PARTS**

6. ☒ Assignment & PTO-1595
7. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)
8. ☐ Information Disclosure Statement & PTO-1449  
☐ Copies of IDS Citation(s)
9. ☐ Preliminary Amendment
10. Small Entity Statement  
☒ New Statement enclosed  
☐ Statement filed in prior application. Status still proper and desired
11. ☒ Return Postcard
12. ☐
13. ☐
14. ☐
15. ☐
16. ☐

**ADDRESS TO:**

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17. If a **CONTINUING APPLICATION**, check appropriate box and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: \_\_\_\_/\_\_\_\_

Prior application information: Examiner: \_\_\_\_\_ Group/Art Unit: \_\_\_\_\_

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PTO/SB/ 10 (6-95) (modified)

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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

**VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS**  
**(37 CFR 1.9(d) & 1.27(c))--SMALL BUSINESS CONCERN**Docket Number (Optional)  
**3941**Applicant or Patentee: Taylor S. Gaultier

Application or Patent No.: \_\_\_\_\_

Filing Date or Issue Date: \_\_\_\_\_

Title: Optimizing Server Delivery of Content by Selective Inclusion of Optional Data Based on Optimization Criteria

I hereby declare that I am

☐ the owner of the small business concern identified below☒ an official of the small business concern empowered to act on behalf of the concern identified below:NAME OF SMALL BUSINESS CONCERN Geoworks CorporationADDRESS OF SMALL BUSINESS CONCERN 960 Atlantic Avenue  
Alameda, CA 94501

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☒ the specification filed herewith with title as listed above.  
☐ the application identified above.  
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention must file separate verified statements averring to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(c).

Each such person, concern or organization having any rights in the invention is listed below

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☐ Each such person, concern or organization is listed below

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# OPTIMIZING SERVER DELIVERY OF CONTENT BY SELECTIVE INCLUSION OF OPTIONAL DATA BASED ON OPTIMIZATION CRITERIA

INVENTOR

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## BACKGROUND

### Field of Invention

The present invention relates generally to systems, methods, and software products for delivering content in client-server networks, and more particularly, to systems, methods, and software products that optimize the delivery of such content in response to optimization criteria.

### Background of the Invention

The Internet generally, and the World Wide Web specifically, provide a client-server model of content delivery, in which content stored on a server at a web site is delivered over a communications channel to a client device. Conventionally, the content as structured by the author is delivered by the server to all requesting clients in the same form. That is, the server does not change the structure of the content to accommodate the performance characteristics of the communication channel to a particular client, or the performance characteristics of the client itself. At best, the client re-formats the received content based on its own capabilities (e.g. a text only browser will filter out images, but still must receive the images, thereby consuming bandwidth).

This delivery model is not satisfactory when there are many different types of clients, with varying performance capabilities and varying communication channels. For example, today a web site may be accessed by many different types of clients, from conventional full size computers with large screen displays (e.g. 13" to 17") and full color capabilities (16M colors) to small handheld computers with small screens (e.g. 4" to 6") and limited color capabilities (256 colors), to cellular telephones with very small screens (1" -2") and virtually no color capabilities (2 - 8 colors monochrome). A web page with many images that is designed to be viewed on a full size, full color monitor will not appear at all properly on a cellular telephone display with only monochrome

output. Moreover, the cellular telephone has a much lower bandwidth capability than a standard desktop computer, and thus would require significantly more time (and hence more cost and delay) in loading such a web page.

Typically, in order to accommodate these varying capabilities, a server must maintain many different web sites or web pages, each designed to be served to a particular class of client. But this approach is very labor intensive, particularly for sites that must be updated frequently, since the many different sizes and content selections for a given page must be kept in synchrony to all have the same current content. Further, display capabilities are only one characteristic that affects client performance. Different client devices may operate with different bandwidth capabilities, having different processor and memory capacities, or even have different pricing schemes associated with retrieval of content. When considering the possible combinations of factors that affect client performance, such as bandwidth and display capabilities (to name just two), the number of different possible web sites that need to be maintained quickly becomes unmanageable.

An alternative solution to maintaining multiple web sites is to design web sites that are acceptable to only the lowest performance devices that are going to access the site. But this approach yields simple sites that do not fully allow higher performance devices to take advantage of their performance features.

Accordingly, it is desirable to provide a system, method, and software product that can optimize delivery of content to client devices in response to optimization criteria. In particular, it is desirable to provide a web server that can efficiently deliver content to client devices having varying bandwidth, display, and other performance characteristics.

## SUMMARY OF THE INVENTION

The present invention overcomes the limitations of the conventional systems by providing a server software product and a method that selectively delivers content to a client in response to optimization constraints indicative of the client's performance characteristics. The server delivers content such as web pages, images, text, audio, video, and any other data types to varying client devices with varying performance characteristics.

The present invention augments existing markup languages with a new tag that demarcates a group of one or more content items that may be optionally included in the content to be delivered. Where there are multiple optional items in a group, these items are alternatives for inclusion in the content, and one of the items is selected by the server for inclusion in the content based on an optimization constraint dependent on the characteristics of the client device.

Preferably, the items are ordered in a manner corresponding to some set of client characteristics; one of these items is selected as the content to be delivered when the content is requested. The characteristics may be performance characteristics of the client or communication channel, or other attributes of the client. For example, the ordering of optional content items may be with respect to highest performance to lowest performance devices, or vice versa. For example, in web page providing directions to a desired location, a group of optional content may include first an image of a map illustrating the directions, followed by a detailed text description of the directions, followed by a very short text description of the directions. Thus, each of these items is intended for different types of client devices, which can best receive and display the directions in one of these formats, and one of these forms of information will be delivered to a requesting client.

When the server is processing a client request for the document, any content that is demarcated as being optional is included in the delivered content depending on the performance characteristics of client that is requesting the content. More particularly, the server processes the items of optional content in the order in which they are demarcated together. Thus, in an embodiment in which optional items are ordered from highest to lowest performance capability, if the requesting client is a high performance device (including having a high bandwidth connection), then the first item of content is included in the document; if the requesting client is a low performance device, then the first item(s) is skipped until the appropriate item of content is reached. Obviously, the reverse of this ordering and selection process is possible. The selection of which item of content is appropriate for which client device is based on an optimization constraint. The server stores data which associates different types of client devices or performance characteristics with different levels of the optimization

constraint. The number of different types of client devices or performance characteristics is not limited. The server selects the appropriate optimization constraint based on observable characteristics of the client device requesting the content. These observable characteristics include the device type, browser type, operating system,  
5 processor, memory, user preferences, software installed on the client, and language type for the requested content.

A set of selection rules is used by the server to select which of the optional items of content are to be delivered to the client device based on the optimization constraint. More particularly, the rules map any optimization constraint to one of the items of  
10 content. In a preferred embodiment, where the optional items are ordered with respect to their performance demands, the optimization constraint is used as an index into these items to select the appropriate one for the client. The process may be understood as one of selectively reducing the data stream provided to a specific client based on encoding of optionally selectable/filterable data, and an optimization constraint value  
15 that controls the selection process.

The tag that demarcates optional content can obviously be any useful string. In one embodiment, the tag is usefully called the "OPT" tag. The OPT tag is formatted using standard SGML formats, with <OPT> indicating the beginning of the optional content, and terminated by </OPT> indicating the end of the optional content. Within  
20 the OPT tag there may be zero or more delimiting tags separating alternative items of optional content. The preferred delimiting tag for separating alternative items is <DOPT> for "Delimiting OPTion". A well formed OPT tag has the following form:

<OPT> *content* {<DOPT>*alternative content*}\*</OPT>

Zero or more <DOPT> tags with their corresponding *alternative content* follow in  
25 an order, which may be from highest to lowest performance requirements, or vice versa. In the former ordering, this typically means from largest data size (e.g. length of text or use of images) to smallest data size.

Examples:

1. <OPT>Real Time Stock </OPT>Quotes
2. <OPT>Turn left<DOPT>Left<DOPT>L</OPT> on First Street

In the first example, the optional content "Real Time Stock" is delivered only to client devices that have no performance limitations, e.g. are not bandwidth limited, and so receive the complete text "Real Time Stock Quotes". A client device that has any optimization constraint only receives "Quotes" when this content is delivered. Thus, the unconstrained version is appropriate, for example, for a standard desktop computer, but the latter version is better supplied to a device with a very small screen or low bandwidth capabilities, such as a cellular telephone.

In the second example, of directions being given to a location, the alternative content selections become progressively smaller, being ordered left to right from least constrained (highest performance) to most constrained (lowest performance). Thus, the first item "Turn left" is delivered to a high performance client, while the last item "L" is suitable for client devices with lower bandwidth and/or smaller displays.

One preferred method of using the optimization constraint as an index into the optional items of content uses both positive and negative numbers as optimization constraints. Positive numbers index from least constrained items to most constrained items. In example 2) above, an optimization constraint of (1) would select "Turn left" while an optimization constraint of (2) would select "Left". Negative numbers index from most constrained to least; thus (-1) would select "L", which (-2) would also select "Left". Preferably, positive one (1) always selects the least constrained item, and negative one (-1) selects the most constrained item; zero (0) is treated as negative one (-1). It is preferable rule that a negative number may never select the least constrained most item, and a positive number may never select the most constrained item. With these rules, any number of optional items of content may encoded in the document and selectively delivered. Again, whether the ordering is left to right or right to left for high to low constraint is an implementation detail; which ever is used, the selection logic is implemented to match.

Using the present invention, it is possible to build a single server which is capable of serving information to multiple clients, over varying bandwidth connections, or with other varying performance characteristics.

The amount of effort required to support a growing number of clients is reduced from an order of  $O(2)$  [for a traditional system], or a square relationship, to an order of  $O(1)$ , or a linear relationship.

5 This savings of effort required to maintain such a server brings the possibility of serving data to a wide range of client devices over a broad scale of bandwidth connections to a reality.



## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an illustration of a system in accordance with the present invention.

Fig. 2 is an illustration of a method of operating a server in accordance with the present invention.

5 Figs. 3a-3c illustrates an example of an encoded content item with optional content, and different outputs of optional content according to varying levels of optimization constraint.

FIG. 3a-3c

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, there is shown an illustration of a system in accordance with the present invention. The system includes a server 102 and a content database 100. The server 102 of interest is the software product that executes on a conventional server grade computer, such as a workstation, minicomputer, mainframe, or the like. The server 102 is configured to execute in accordance with the functional features as described herein.

The content database 100 stores content in a suitable format, such as a markup language, ASCII, and the like. Suitable markup languages include HyperText Markup Language (HTML), Extended Markup Language (XML), Hypertext Dynamic Markup Language (HDML), Tagged Text Markup Language (TTML). The server 102 is then a server of the appropriate type of markup language, and includes functions for receiving requests for a content item, typically indicated by a uniform resource locator (URL), and parsing markup language tags, creating a content item in response to a request, and transmitting the content item to the requesting client.

Some of the content in the database 100 is structured to include at least one item of optional content demarcated by a specific markup language tag. The preferred tag is <OPT>, as described above, and its terminating tag </OPT>. Any number of alternate items of content may be enclosed, each delimited by a specific tag, such as <DOPT>. The items are preferably ordered with respect to some performance criteria, such as bandwidth capability. One ordering is from left to right, from lowest constraint, highest performance devices, to highest constraint, lowest performance devices. Schematically, a portion of content structured in this manner is as follows:

<OPT>*lowest constraint data*<DOPT>*next lowest constraint*<DOPT>....<DOPT>*highest constraint data*</OPT>.

In one embodiment, these tags are part of meta-language that itself marks up other markup languages. In this embodiment, the OPT and DOPT are set off by << and >>, to indicate to the server 102 that they are part of the meta-language, and not part of the underlying markup language. In this manner, any number of different markup language content items are stored in the database 100, and they are marked up in the meta-language. Various different client devices use various different ones of the

markup languages. Client device specific pages are thus constructed in the different markup languages. These client specific pages are marked up with the meta-language tags, and here particularly the OPT tag is used to specify optional content that can be merged or integrated into the client specific pages. In a preferred embodiment, the content within the OPT tags is variable data selected from the database 100 in response to a query; the server filters the query response using the OPT mechanism described herein. The server 102 can thus deliver content in any of the markup languages, and with any of the optionally defined content to any requesting client; this allows different clients which use different markup languages to interface with the server 102.

The server 102 communicates with various types of client devices 106 over a communications network 104. The client devices 106 include desktop and laptop computers, pocket organizers, personal digital assistants, cellular telephones, and any other type of communication device adapted for Internet or Web based communications (i.e. HTTP). The server 102 selectively provides optional content from a content item, depending on an optimization constraint associated with a requesting client device 106.

Referring to Fig. 2, there is shown a method in accordance with the present invention. The server 102 receives 200 a request for a content item from the database 100. The server 102 determines 202 an optimization constraint associated with the requesting client device. The server 102 compiles 204 the requested content item, including selectively including content that is set forth as optional content, and if necessary, by selecting one of the alternate items of content, based on the optimization constraint. The server 102 then transmits 206 the compiled content item to the client. Determining the optimization constraint preferably includes determining either a client device type, client operating system type, client browser type, content language type of the requested content, communication bandwidth of the client, client processor, memory, user preferences, or software installed on the client, or a combination of any of these or other attributes. Selecting one of the alternate items preferably includes applying a set of rules that map the optimization constraint to selected ones of the optional content items.

One set of rules uses the optimization constraint as an index, where the items are ordered in manner corresponding to performance capabilities of the client devices. This set of rules is described as follows:

1. Determine the number of optional items. If only one is available, add a blank option as the rightmost (most constrained) option.
2. Retrieve the optimization constraint which corresponds to the client device.
3. Positive numbers select from least constrained to most constrained. Negative numbers select from most constrained to least constrained.
4. The positive number one (1) selects the least constrained item.
5. The negative number one (-1) selects the most constrained item.
6. The number zero (0) is equivalent to negative one (-1)
7. Use the optimization constraint as an index into the optional items, where 1 selects the least constrained item, 2 the second least constrained item, and so on; -1 selects the most constrained item, -2 selects the second to most constrained item and so on.
8. A negative number may never select the least constrained item.
9. A positive number may never select the most constrained item.

The following table illustrates an example mapping where there are 5 items of alternate content, using a left to right, least to most constraint ordering:

Table 1

	1 <sup>st</sup> Item (Least Constrained)	2 <sup>nd</sup> Item	3 <sup>rd</sup> Item	4 <sup>th</sup> Item	5 <sup>th</sup> Item (most constrained)
Opt. Constraint $n$ which selects this item:	$n=1$	$n=2,$ $n \leq -4$	$n=(3, -3)$	$n \geq 4,$ $n=-2$	$n=(-1, 0)$

In one embodiment, the optimization constraint is defined with respect to the markup language of the content being served. The next table defines one set of optimization constraints for this embodiment:

Table 2

Language/ Bandwith	Optimization Constraint
HTML (on T1 connection at 1.5Mb/s)	1
HTML (wired modem <=56Kb/s)	2
HTML (wireless <=9600 bps)	-3
HDML (<9600 bps)	-2
TTML	-1

The assignment of optimization constraints based on content language is a reflection of the typical bandwidth limitations of client devices that use the specific content language. HTML is generally used in a desktop environment where connection speeds are relatively high and display capacities are also relatively high, and thus a low constraint is appropriate, particularly for HTML on a T1 connection. HTML on a wireless device, such as a PDA is more constrained, and hence a higher constraint. HDML is generally used in a digital cellular telephone communications arena, with a transmission speed limited to 9600 bps and size of messages limited to the telephone memory, hence even more constrained environment, as reflected by the optimization constraint. TTML is generally used over GSM style SMS messages which are limited to 160 characters, and thus is the most constrained environment, and thus given a -1 optimization constraint.

As the server 102 scans an item of content, it comes across an OPT encoded item of data. The server 102 can determine the optimization constraint based on the markup language as in Table 2, or using any other set of rules mapping information about the client device attributes to an optimization value. The determined value is then used as an index into the items of DOPT portions, to select the appropriate item of content. This process is repeated for each OPT encoded portion of the requested content, so that the server 102 ultimately compiles a complete content item. The completed content item is transmitted to the client device.

Figs. 3a-3c illustrates a more complex example of the present invention. Here, a content item 300 in Fig. 3a is encoded in a markup language, along with multiple portions set out as optional content between OPT tags, some of which have multiple alternate items delimited by DOPT tags. Fig. 3b illustrates the output of this content item by selection for a least constrained environment, HTML over T1. Note that all of

the optional text in each OPT section is included. Fig. 3c illustrates output of this same content item by selection for the most constrained items for a TTML environment. As is apparent then, a single content item may be easily structured to serve multiple different client devices, without having to maintain many different versions of the content item, as in conventional systems.

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### Claims

1. A method of optimizing the delivery of content data from a web server to a client device, said method comprising:
  - receiving a request for content data from a client device;
  - selecting optional content of the content data responsive to performance characteristics of the requesting client device; and
  - transmitting the selected optional content to the requesting client device.
2. The method of claim 1 wherein selecting optional content further comprises:
  - selecting one of a plurality of content items responsive to the performance characteristics of the requesting client device.
3. The method of claim 2 wherein the plurality of content items is ordered with respect to highest and lowest performance characteristics of client devices, and selecting comprises:
  - responsive to a client device having a highest performance characteristic, selecting a first ordered content item.
4. The method of claim 2 wherein the plurality of content items is ordered with respect to highest and lowest performance characteristics of client devices, and selecting further comprises:
  - responsive to a client device having a highest performance characteristic, selecting a last ordered content item.
5. The method of claim 3 wherein optimization constraints are assigned to classes of client devices, and each class of client device has different performance characteristics, further comprising:
  - determining the performance characteristics of the requesting client device;
  - determining a class of client device to which the requesting client device belongs responsive to the determined performance characteristics of the requesting client device;

9            assigning the requesting client device an optimization constraint  
10            responsive to the determined class of client device to which the  
11            requesting client device belongs; and  
12            selecting comprises selecting a content item whose order corresponds to  
13            the optimization constraint.

1    6.    The method of claim 5 further comprising:

2            responsive to an optimization constraint specifying a class of device  
3            having a lowest performance characteristic, selecting a content  
4            item requiring a least amount of bandwidth to be transmitted.

1    7.    The method of claim 5 further comprising:

2            responsive to an optimization constraint specifying a class of device  
3            having a lowest performance characteristic, selecting a content  
4            item comprising a least amount of data.

1    8.    The method of claim 2 wherein optimization constraints are associated with each  
2    content item, and the optimization constraints index classes of client devices, wherein  
3    each class of client device has different performance characteristics, further comprising:

4            assigning the requesting client device an optimization constraint  
5            responsive to the performance characteristics of the requesting  
6            client device; and  
7            selecting comprises selecting a content item responsive to the assigned  
8            optimization constraint.

1    9.    The method of claim 8 wherein assigning an optimization constraint responsive  
2    to the performance characteristics of the requesting client device further comprises:

3            determining a connection type in use by the client device; and  
4            associating an optimization constraint responsive to the connection type  
5            of the client device.

1    10.   The method of claim 8 wherein assigning an optimization constraint responsive  
2    to the performance characteristics of the requesting client device further comprises:



determining a web browser in use by the requesting client device; and  
 associating an optimization constraint further comprises:  
 associating an optimization constraint responsive to the web browser in  
 use by the requesting client device.

11. The method of claim 8 wherein assigning an optimization constraint responsive  
 to the performance characteristics of the requesting client device further comprises:  
 determining a processor type in use by the requesting client device; and  
 associating an optimization constraint further comprises:  
 associating an optimization constraint responsive to the processor type in  
 use by the requesting client device.

12. The method of claim 8 wherein assigning an optimization constraint responsive  
 to the performance characteristics of the requesting client device further comprises:  
 determining an amount of memory in use by the requesting client device;  
 and associating an optimization constraint further comprises:  
 associating an optimization constraint responsive to the amount of  
 memory in use by the requesting client device.

13. The method of claim 8 wherein assigning an optimization constraint responsive  
 to the performance characteristics of the requesting client device further comprises:  
 determining a display type in use by the requesting client device; and  
 associating an optimization constraint further comprises:  
 associating an optimization constraint responsive to the display type in  
 use by the requesting client device.

14. A system for transmitting content data over a network, comprising:  
 a content server, for receiving a request for content from a client device,  
 selecting optional content of the content data responsive to  
 performance characteristics of the client device, and transmitting  
 the selected optional content to the requesting client device.

1 15. The system of claim 14 further comprising a plurality of client devices, for  
2 transmitting requests for content to the content server and receiving content transmitted  
3 from the content server, at least one client device having different performance  
4 characteristics than at least one other client device.

1 16. The system of claim 14 wherein optimization constraints index classes of client  
2 devices based upon performance characteristics and the optional content within a  
3 context data is indexed by the optimization constraints, and the content server selects  
4 optional content from the context data responsive to assigning an optimization  
5 constraint to a requesting client device.

1 17. A method of creating an electronic document forming a collection of content  
2 data to permit selective transmission of content data, comprising:

3 creating content data representing alternate versions of content;  
4 inserting the content data into the content; and  
5 demarcating the content data to indicate to a processor that the content  
6 data are selectable.

1 18. The method of claim 17 wherein the content items have different data sizes, and  
2 inserting the content items further comprises:

3 ordering the content items with respect to an amount of bandwidth  
4 required to transmit the content items.

1 19. The method of claim 17 in a system in which client devices receive the electronic  
2 documents for display, and the client devices have different performance characteristics  
3 and inserting the content items further comprises:

4 ordering the content items with respect to performance characteristics of  
5 client devices.

1 20. A method of delivering a web page comprising:

2 receiving a request for transmission of the web page from a remote  
3 device;  
4 determining at least one performance characteristic of the remote device;

5 selecting optional content of the web page responsive to the determined  
6 at least one performance characteristic; and  
7 transmitting the selected optional content to the remote device.

1 21. The method of claim 20 wherein selecting optional content further comprises:  
2 selecting one of a plurality of content items responsive to the  
3 performance characteristics of the requesting client device.

1 22. The method of claim 21 wherein the plurality of content items is ordered with  
2 respect to highest and lowest performance characteristics of client devices, and selecting  
3 comprises:  
4 responsive to a client device having a highest performance characteristic,  
5 selecting a first ordered content item.

1 23. The method of claim 21 wherein the plurality of content items is ordered with  
2 respect to highest and lowest performance characteristics of client devices, and selecting  
3 further comprises:  
4 responsive to a client device having a highest performance characteristic,  
5 selecting a last ordered content item.

1 24. The method of claim 22 wherein optimization constraints are assigned to classes  
2 of client devices, and each class of client device has different performance  
3 characteristics, further comprising:  
4 determining the performance characteristics of the requesting client  
5 device;  
6 determining a class of client device to which the requesting client device  
7 belongs responsive to the determined performance characteristics  
8 of the requesting client device;  
9 assigning the requesting client device an optimization constraint  
10 responsive to the determined class of client device to which the  
11 requesting client device belongs; and

12 selecting comprises selecting a content item whose order corresponds to  
13 the optimization constraint.

1 25. The method of claim 24 further comprising:  
2 responsive to an optimization constraint specifying a class of device  
3 having a lowest performance characteristic, selecting a content  
4 item requiring a least amount of bandwidth to be transmitted.

1 26. The method of claim 24 further comprising:  
2 responsive to an optimization constraint specifying a class of device  
3 having a lowest performance characteristic, selecting a content  
4 item comprising a least amount of data.

1 27. The method of claim 21 wherein optimization constraints are associated with  
2 each content item, and the optimization constraints index classes of client devices,  
3 wherein each class of client device has different performance characteristics, further  
4 comprising:  
5 assigning the requesting client device an optimization constraint  
6 responsive to the performance characteristics of the requesting  
7 client device; and  
8 selecting comprises selecting a content item responsive to the assigned  
9 optimization constraint.

1 28. The method of claim 27 wherein assigning an optimization constraint responsive  
2 to the performance characteristics of the requesting client device further comprises:  
3 determining a connection type in use by the client device; and  
4 associating an optimization constraint responsive to the connection type  
5 of the client device.

1 29. The method of claim 27 wherein assigning an optimization constraint responsive  
2 to the performance characteristics of the requesting client device further comprises:  
3 determining a web browser in use by the requesting client device; and  
4 associating an optimization constraint further comprises:

5 associating an optimization constraint responsive to the web browser in  
6 use by the requesting client device.

1 30. A computer-readable medium for use in a system having a web server for  
2 storing content data, and which is connected to a plurality of client devices, the  
3 computer-readable medium storing instructions which cause the server to:  
4 receive a request for content data from a client device;  
5 select optional content of the content data responsive to performance  
6 characteristics of the requesting client device; and  
7 transmit the selected optional content to the client device.

1 31. The computer-readable medium of claim 30 wherein the stored instructions  
2 further cause the processor to:  
3 select one of a plurality of content items responsive to the performance  
4 characteristics of the requesting client device.

1 32. The computer-readable medium of claim 31 wherein the plurality of content  
2 items is ordered with respect to performance characteristics of client devices, and the  
3 stored instructions further cause the processor to:  
4 responsive to a client device having a highest performance characteristic,  
5 select a first ordered content item.

1 33. The computer-readable medium of claim 31 wherein optimization constraints  
2 are assigned to classes of client devices, and each class of client device has different  
3 performance characteristics, and the stored instructions further cause the processor to:  
4 determine the performance characteristics of the requesting client device;  
5 determine a class of client device to which the requesting client device  
6 belong responsive to the performance characteristics of the  
7 requesting client device;  
8 assign the requesting client device an optimization constraint responsive  
9 to the determined class of client device to which the requesting  
10 client device belongs; and

11 select a content item corresponding to the optimization constraint.

1 34. The computer-readable medium of claim 32 wherein optimization constraints  
2 are associated with each content item, and the optimization constraints index classes of  
3 client devices, wherein each class of client device has different performance  
4 characteristics, and the stored instructions further cause the processor to:

5 assign the requesting client device an optimization constraint responsive  
6 to the performance characteristics of the requesting client device;

7 and

8 select a content item responsive to the assigned optimization constraint.

1 35. The computer-readable medium of claim 34 wherein the stored instructions  
2 further cause the processor to:

3 determine a connection type in use by the client device; and

4 associate an optimization constraint responsive to the connection type of  
5 the client device.

1 36. A method of optimizing the delivery of content data from a web server to a  
2 client device, wherein the content data is comprised of content items, optimization  
3 constraints are associated with each content item, the optimization constraints index  
4 classes of client devices, and wherein each class of client device has different  
5 performance characteristics, the method comprising:

6 receiving a request for content data from the client device;

7 determining a class of device to which the requesting client device

8 belongs responsive to the performance characteristics of the  
9 requesting client device;

10 assigning the requesting client device an optimization constraint

11 responsive to the determined class of client device;

12 selecting one of a plurality of content items responsive to the assigned  
13 optimization constraint; and

14 transmitting the selected optional content to the client device.

1 37. In a system in which a content server provides content to client devices, an  
2 optional content indicating system for demarcating optional content for transmission,  
3 comprising:

4 a <OPT> tag, placed before a content item to indicate a beginning of  
5 optional content;

6 a <DOPT> tag, placed before a content item which is an alternative for  
7 transmission to the content item demarcated by the<OPT> tag;  
8 and

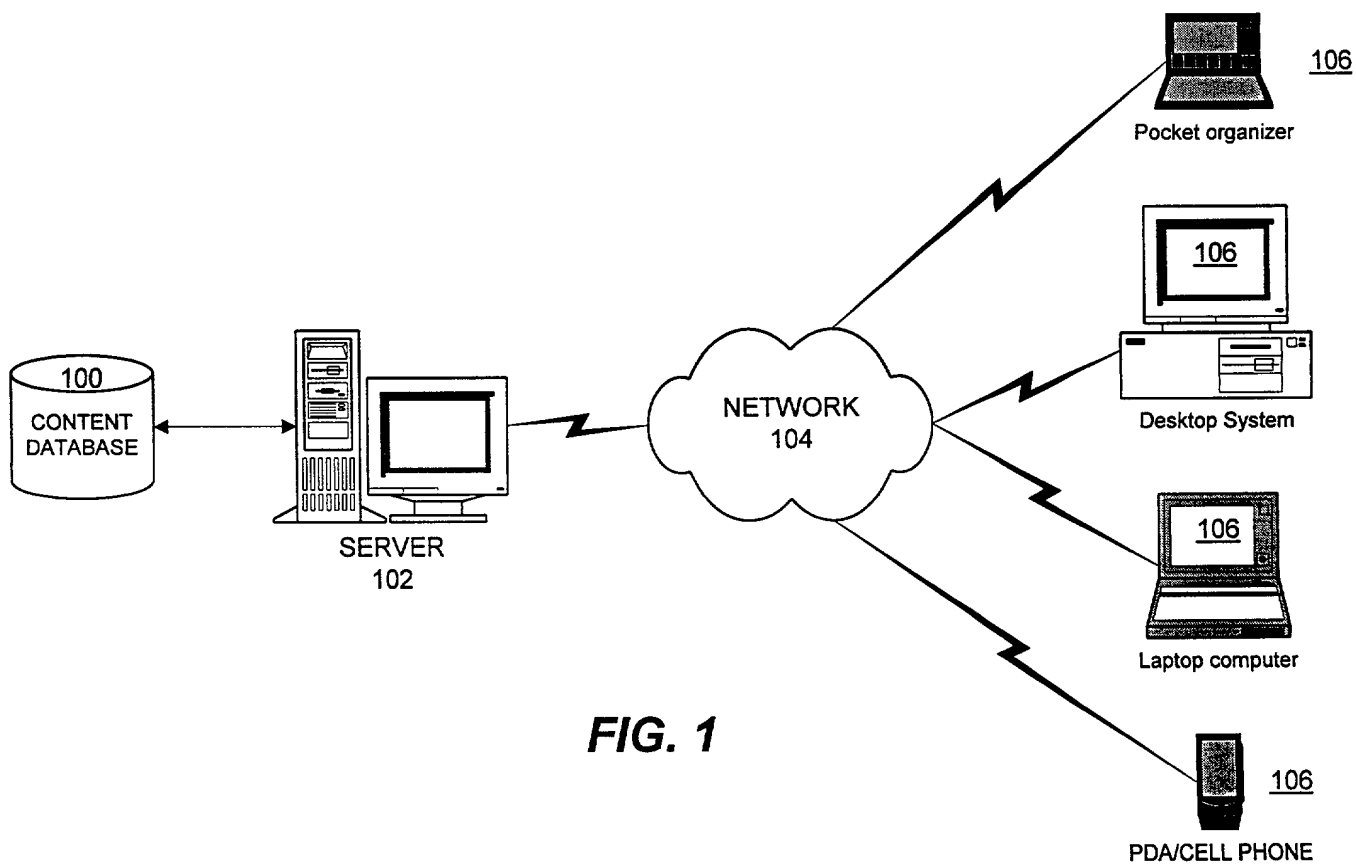
9 a </OPT> tag, placed after a content item, to indicate an end of the  
10 optional content.

## OPTIMIZING SERVER DELIVERY OF CONTENT BY SELECTIVE INCLUSION OF OPTIONAL DATA BASED ON OPTIMIZATION CRITERIA

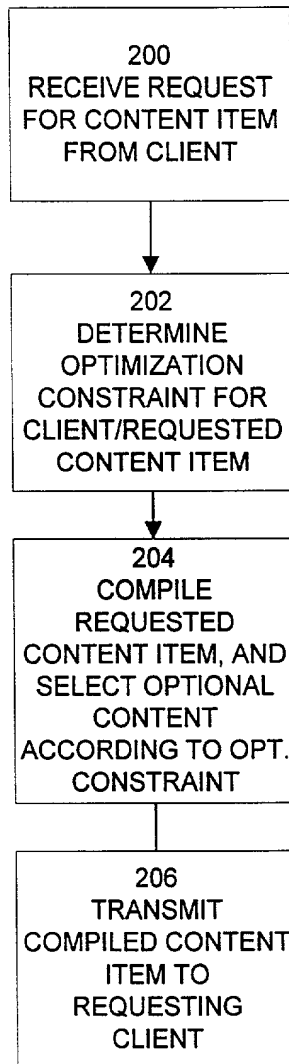
### ABSTRACT OF THE DISCLOSURE

Optimization constraints are used to select an appropriate content item from an available group of content items which are ordered in a specific manner to facilitate the proper selection of the content item, even if the exact item desired is not present. The server is then able to insert the selected content item into the outgoing content page requested by the client. The optimization constraints can be, but are not limited to, any one of the following: communication channel performance (bandwidth), client operating system, client processor, client display capabilities, client installed software (video or audio codecs for example), and/or user preferences. A software product and method enable selective delivery of content to client devices of varying performance characteristics, including varying bandwidth, by selective filtering and inclusion of markup language content using tags demarcating optional content. The optional content may include a number of alternate items of content. An optimization constraint is used to select one of the items. The server includes the selected item in an item of content requested by a client device. The optimization constraints are associated with varying levels of client/communication channel performance.





**FIG. 1**



**FIG. 2**

Directions<OPT> to our offices<OPT>:<BR>  
 <OPT>CONTINUE<DOPT>C</OPT><OPT> onto</OPT> HARRISON ST<OPT>  
 --></OPT> <OPT>Go </OPT><OPT>a short distance<DOPT>short  
 distance</OPT><OPT> and then</OPT><BR><OPT>TURN  
 RIGHT<DOPT>R</OPT><OPT> onto</OPT> 2ND ST<OPT> --></OPT>  
 <OPT>Go  
 </OPT>0.1 <OPT>miles<DOPT>m</OPT><OPT> and  
 then</OPT><BR><OPT>TURN LEFT<DOPT>L</OPT><OPT> onto</OPT>  
 WEBSTER  
 ST<BR><OPT>CONTINUE<DOPT>C</OPT> <OPT>a short  
 distance<DOPT>short  
 distance</OPT><BR><BR><OPT>Total distance is<DOPT>Total:</OPT> 0.2  
 <OPT>miles<DOPT>m</OPT><OPT><BR>Estimated driving  
 time<DOPT>,</OPT> 0.9 <OPT>minutes<DOPT>min</OPT>

FIG. 3a

Compiled For Low  
 Constraint/High  
 Performance Device  
 (e.g HTML)

Directions to our offices:  
 CONTINUE onto HARRISON ST --> Go a short distance and then  
 TURN RIGHT onto 2ND ST --> Go 0.1 miles and then  
 TURN LEFT onto WEBSTER ST  
 CONTINUE a short distance

Total distance is 0.2 miles  
 Estimated driving time 0.9 minutes

FIG. 3b

Compiled For High  
 Constraint/Low  
 Performance Device  
 (e.g TTML)

Directions  
 C HARRISON ST short distance  
 R 2ND ST 0.1 m  
 L WEBSTER ST  
 C short distance

Total: 0.2 m, 0.9 min

FIG. 3c

0010/PTO Rev. 6/95  <div style="text-align: center;"> <b>DECLARATION FOR                      UTILITY OR DESIGN                      PATENT APPLICATION</b> </div>	<div style="text-align: center;"> <b>U.S. Department of Commerce                      Patent and Trademark Office</b> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Attorney Docket Number</td> <td>3941</td> </tr> <tr> <td>First Named Inventor</td> <td>Taylor S. Gautier</td> </tr> <tr> <td colspan="2" style="text-align: center;"><i>COMPLETE IF KNOWN</i></td> </tr> <tr> <td>Application Number</td> <td>Not Yet Known</td> </tr> <tr> <td>Filing Date</td> <td>May 14, 1999</td> </tr> <tr> <td>Group Art Unit</td> <td>Not Yet Known</td> </tr> <tr> <td>Examiner Name</td> <td>Not Yet Known</td> </tr> </table>	Attorney Docket Number	3941	First Named Inventor	Taylor S. Gautier	<i>COMPLETE IF KNOWN</i>		Application Number	Not Yet Known	Filing Date	May 14, 1999	Group Art Unit	Not Yet Known	Examiner Name	Not Yet Known
Attorney Docket Number	3941														
First Named Inventor	Taylor S. Gautier														
<i>COMPLETE IF KNOWN</i>															
Application Number	Not Yet Known														
Filing Date	May 14, 1999														
Group Art Unit	Not Yet Known														
Examiner Name	Not Yet Known														
<div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> Declaration Submitted with Initial Filing                         </div> <div>                         OR                     </div> <div> <input type="checkbox"/> Declaration Submitted after Initial Filing                         </div> </div>															

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**OPTIMIZING SERVER DELIVERY OF CONTENT BY SELECTIVE INCLUSION OF OPTIONAL DATA BASED ON OPTIMIZATION CRITERIA**

the specification of which

(Title of the Invention)

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International Application Number [ ] and was amended on (MM/DD/YYYY) [ ] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations. § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 119 (a)-(d) or § 385(b) of any foreign application(s) for patent or inventor's certificate, or § 365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES      NO
			<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	
60/097,333	8/20/98	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental sheet attached hereto.

## DECLARATION

Page 2

I hereby claim the benefit under Title 35, United States Code § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Name	Registration Number	Name	Registration Number
<b>Robert R. Sachs</b> <b>Dana S. Rao</b>	<b>42,120</b> <b>43,875</b>		

☐ Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.

Please direct all correspondence to:

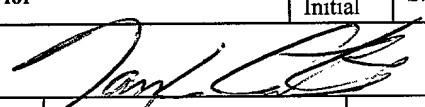
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**Name of Sole or First Inventor:** ☐ A petition has been filed for this unsigned inventor

Given Name	<b>Taylor</b>	Middle Initial	<b>S.</b>	Family Name	<b>Gautier</b>	Suffix e.g. Jr.	
Inventor's Signature					Date	<b>4/27/99</b>	
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Mailing Address	<b>2237 Trafalgar Place</b>						
Mailing Address							
City	<b>Oakland</b>	State	<b>CA</b>	Zip	<b>94611</b>	Country	<b>U.S.A.</b>

☐ Additional inventors are being named on supplemental sheet(s) attached hereto